

## Well Drilling Methods

### Hand-drilled well



### Small rig well



### Large rig well



The cost of a 30m hand-drilled well is about 15% of the cost of a 30m large rig well.

### New and rehabilitated water storage tanks



## Hand Pump Options

### Erobon – shallow



### India Mark II – medium



### Vergnet – deep



Erobon locally made, India and Vergnet imported. All locally serviceable.

### Solar pump and small storage tank



### USAID/PEPAM

### Senegal Millennium Water and Sanitation Program

Programme d'Eau Potable et d'Assainissement du Millénaire au Sénégal

## Water Supply Cost Comparison for Rural Senegal

December 2014

### Conclusions

- The use of hand-drilled wells and small rig wells, where geology and aquifers are favorable, opens up new technical options for sites with small and medium demands – including multiple hand pumps and solar pumps.
- Selection of technologies on the basis of life-cycle costs leads to different conclusions than selection on the basis of initial costs.
- For small demands, one or more shallow hand-drilled wells and hand pumps are very inexpensive. But if deep wells are required, solar pumps or line extensions of short length (if possible) can be less costly.
- For medium demands, solar pumps have higher initial costs than diesel pumps, but lower life-cycle costs.
- Larger towns need larger diesel-powered systems, and the cost of piping for house connections greatly increases initial and life-cycle costs.
- Diesel and solar pumps can support small-scale irrigation.
- Good operations and maintenance are needed for any technology to provide long-term benefits.



### Choosing a Water Supply Technology

How do different technical options for rural water supply compare in terms of initial costs, initial costs per person, and life-cycle costs over 30 years, under different conditions of population and depth to water?

This brochure summarizes the experiences and analysis of the design, installation, and monitoring of more than 340 locally managed water supply systems in southern and western Senegal over the period 2010–2014, in collaboration with local governments, regional technical services, local and national nongovernmental organizations, local well drillers (many trained and equipped by the project), and local construction companies.

Prepared by RTI International, Relief International/EV-VITA, and TetraTech/ARD, Inc. for USAID/Senegal under the USAID/PEPAM project.

Cooperative Agreement No 685-A-00-09-00006-00

RTI International is a registered trademark and a trade name of Research Triangle Institute.



# USAID / PEPAM Project: Water Supply Technology Cost Comparison

Application		Water Supply System Costs, based on Required Well Depth at Site				
Water Demand	Water Uses / Distribution	Technical Options	30m	50m	70m	90m
Small  100-1,200 people  3.5-42 m³/day	Potable Water, Small Livestock; No Distribution  (Note: line extension system costs depend on population and length to the site, not well depth)	Hand Pump 400 People	HD Well Initial Cost: 4.6M CFA Initial: 11,400 CFA/person Life Cycle: 1,200 CFA/person/yr	SR Well Initial Cost: 9.5M CFA Initial: 23,600 CFA/person Life Cycle: 1,600 CFA/person/yr	SR Well Initial Cost: 9.9M CFA Initial: 24,700 CFA/person Life Cycle: 2,000 CFA/person/yr	LR Well Initial Cost: 24.6M CFA Initial: 61,500 CFA/person Life Cycle: 3,000 CFA/person/yr
		Solar Pump 400 people	SR Well Initial Cost: 12.0M CFA Initial: 30,100 CFA/person Life Cycle: 1,600 CFA/person/yr	SR Well Initial Cost: 12.8M CFA Initial: 32,000 CFA/person Life Cycle: 1,700 CFA/person/yr	SR Well Initial Cost: 13.7M CFA Initial: 34,100 CFA/person Life Cycle: 1,800 CFA/person/yr	LR Well Initial Cost: 20.8M CFA Initial: 52,100 CFA/person Life Cycle: 2,400 CFA/person
		Line Extensions 400 people	1 KM Initial Cost: 2.9M CFA Initial: 7,200 CFA/person Life Cycle: 1,800 CFA/person/yr	2 KM Initial Cost: 5.5M CFA Initial: 13,800 CFA/person Life Cycle: 2,000 CFA/person/yr	3 KM Initial Cost: 11.6M CFA Initial: 29,000 CFA/person Life Cycle: 2,500 CFA/person/yr	5 KM Initial Cost: 19.2M CFA Initial: 47,900 CFA/person Life Cycle: 3,200 CFA/person/yr
		Hand Pump 800 People	HD Well Initial Cost: 8.3M CFA Initial: 10,300 CFA/person Life Cycle: 1,100 CFA/person/yr	SR Well Initial Cost: 16.4M CFA Initial: 20,600 CFA/person Life Cycle: 1,500 CFA/person/yr	SR Well Initial Cost: 14.8M CFA Initial: 18,500 CFA/person Life Cycle: 1,500 CFA/person/yr	LR Well Initial Cost: 36.9M CFA Initial: 46,200 CFA/person Life Cycle: 2,300 CFA/person/yr
		Solar Pump 800 people	SR Well Initial Cost: 16.8M CFA Initial: 21,000 CFA/person Life Cycle: 1,100 CFA/person/yr	SR Well Initial Cost: 18.0M CFA Initial: 22,500 CFA/person Life Cycle: 1,100 CFA/person/yr	SR Well Initial Cost: 19.5M CFA Initial: 24,400 CFA/person Life Cycle: 1,200 CFA/person/yr	LR Well Initial Cost: 27.4M CFA Initial: 34,300 CFA/person Life Cycle: 1,600 CFA/person
		Line Extensions 800 people	1 KM Initial Cost: 4.0M CFA Initial: 5,000 CFA/person Life Cycle: 1,600 CFA/person/yr	2 KM Initial Cost: 7.8M CFA Initial: 9,800 CFA/person Life Cycle: 1,800 CFA/person/yr	3 KM Initial Cost: 11.6M CFA Initial: 14,500 CFA/person Life Cycle: 1,900 CFA/person/yr	5 KM Initial Cost: 19.2M CFA Initial: 30,600 CFA/person Life Cycle: 2,500 CFA/person/yr
Medium  1,000-3,000 people  35-105 m³/day	Potable Water, Small Livestock and Productive Uses; Small Storage, Limited Distribution, Stand-posts	Solar Pump 2,000 people	Small Rig Well Initial Cost: 31.6M CFA Initial: 15,800 CFA/person Life Cycle: 800 CFA/person/yr	Small Rig Well Initial Cost: 34.3M CFA Initial: 17,200 CFA/person Life Cycle: 800 CFA/person/yr	Small Rig Well Initial Cost: 37.7M CFA Initial: 18,800 CFA/person Life Cycle: 900 CFA/person/yr	Large Rig Well Initial Cost: 47.8M CFA Initial: 23,900 CFA/person Life Cycle: 1,100 CFA/person/yr
		Diesel Pump 2,000 people	Small Rig Well Initial Cost: 29.2M CFA Initial: 14,600 CFA/person Life Cycle: 1,000 CFA/person/yr	Small Rig Well Initial Cost: 29.5M CFA Initial: 14,800 CFA/person Life Cycle: 1,100 CFA/person/yr	Small Rig Well Initial Cost: 29.8M CFA Initial: 14,900 CFA/person Life Cycle: 1,200 CFA/person/yr	Large Rig Well Initial Cost: 36.6M CFA Initial: 18,300 CFA/Person Life Cycle: 1,300 CFA/person/yr
Large  3,000-15,000 people  150-750 m³/day	Potable Water, Larger Livestock and Productive Uses; Large Storage, Long Distribution, House Connections	Large Rig Well & Diesel Pump 5,000 people	Initial Cost: 163M CFA Initial: 32,800 CFA/person Life Cycle: 2,300 CFA/person/yr	Initial Cost: 163M CFA Initial: 32,800 CFA/person Life Cycle: 2,400 CFA/person/yr	Initial Cost: 163M CFA Initial: 32,800 CFA/person Life Cycle: 2,500 CFA/person/yr	Initial Cost: 163M CFA Initial: 32,800 CFA/person Life Cycle: 2,600 CFA/person/yr
		Large Rig Well & Diesel Pump 10,000 people	Initial Cost: 209M CFA Initial: 20,900 CFA/person Life Cycle: 1,400 CFA/person/yr	Initial Cost: 209M CFA Initial: 20,900 CFA/person Life Cycle: 1,500 CFA/person/yr	Initial Cost: 209M CFA Initial: 20,900 CFA/person Life Cycle: 1,600 CFA/person/yr	Initial Cost: 163M CFA Initial: 32,800 CFA/person Life Cycle: 2,600 CFA/person/yr